

REMARKS AND ARGUMENTS

Pending claims 1-31 were examined and rejected. Claims 22 and 31 were rejected under 35 USC §112, ¶2 for indefiniteness. Claim 22 replicated its base claim 20, and claim 33 included the term “common more rest”. Claims 1, 2, 5, 6, 8-11, and 14 were rejected under 35 USC §102(1) as being anticipated by USP 6,422,598 to Yasui. Claims 3, 4, and 112 were rejected under 35 USC §103(a) as unpatentable over Yasui ‘598 in view of Breed et al. US Pub. 2001/0003168. Claim 13 was rejected under 35 USC §103(a) as unpatentable over Yasui ‘598 in view of USP 5,785,347 to Adolph et al. Claim 7 was rejected under 35 USC §103(a) as unpatentable over Yasui ‘598 in view of USP 6,116,638 to Hosoda. Claims 15-25, and 28-30 were rejected under 35 USC §103(a) as unpatentable over Yasui ‘598 in view of USP 6,302,438 to Stopper et al.

REJECTION OF CLAIMS 22 and 31:

At ¶2 of the pending Office Action, claims 22 and 31 were rejected under 35 USC §112 ¶2 for indefiniteness. Claim 22 replicated without further limiting its base claim 20, and claim 31 included a term with typographical errors: “common more rest”. Applicants have amended claims 22 and 31 to address these issues. So amended, claims 22 and 31 overcome the objected-to indefiniteness. Applicants thank the Examiner for his careful observations regarding these claims.

REJECTION OF CLAIMS 1, 2, 5, 6, 8-11, and 14:

At ¶4 of the pending Office Action, Claims 1, 2, 5, 6, 8-11, and 14 were rejected under 35 USC §102(a) as being anticipated by USP 6,422,598 to Yasui.

Applicants have amended independent claim 1 to explicitly recite that what is captured at step (a) are three-dimensional images of the scene of interest. Support for applicants's use of a method and system that acquires true three-dimensional information may be found in the Specification, for example Figs. 2, 3, 4A, 4B, 5, 7, para. [0044], para. [0056], which references USP 6,323,942 and USP 6,525,740 (both

assigned to assignee herein, Canesta, Inc.) as disclosing true three-dimensional sensor systems and sensor features useable with the presently claimed invention.

USP 6,422,598 to Yasui does not disclose a true three-dimensional data system, but merely a system that acquires very limited information obtained solely by examining the slice-intersection of an infrared beam spot and a target object (see col. 5, line 2-30). At best Yasui acquires a razor-thin profile slice through an object. If Yasui's object were a large sized deck of playing cards, what Yasui acquires is analogous to a single one of those cards. Having acquired the one card, Yasui has no meaningful information as to how thick the object was, e.g., was the object one card thick, fifty-two cards thick, or five thousand cards thick. Yasui also has no idea of where in the object the slice was obtained.

Yasui clearly does not and cannot acquire true three-dimensional information from his method, but rather must make guesses from his single slice of an object as to the volume of the object. As noted, Yasui acquires a single profile slice of data, but Yasui does not acquire data as to the profile to the left or to the right of the single acquired slice. As such, Yasui's data might be substantially similar for a slice through a 50 lb. passenger and for a slice through a 500 lb. passenger. Simply stated, Yasui is blind as to the volume of the target to the left and right of his slice. The fact that a 500 lb. passenger occupies a great deal of volume to the left and to the right of the single slice is unknown to Yasui. Indeed, Yasui does not know from what part of an object his slice was obtained. Yasui simply cannot construct a complete three-dimensional volume representing an object given only his camera position and his single slice data.

In an airbag application, Yasui is forced to make critical decisions about airbag deployment, based upon scant information as to the location and size of a passenger target. Further, even if Yasui somehow acquired true location information as to a portion of the passenger target, Yasui must then guess as to what portion of the target has been acquired. For example, in three-dimensional space, a rear-facing infant seat

in the passenger space might produce an image slice that to Yasui is indistinguishable from the chest of an adult in the passenger space. As noted in col. 5, lines 32-34, Yasui must resort to determining whether an acquired object is a human head by whether the object moves slightly during a long time period. If the object in the car seat was a bag of groceries with a round melon at the top of the bag, the slight motion of the melon as the vehicle moved could trick Yasui into guessing that the melon must be a human head, and that the grocery bag must be a human torso. This level of imprecision advantageously need not be resorted to with the present invention because true three-dimensional data are acquired.

By contrast, data acquired by the present invention is true three-dimensional information, which information is acquired not merely for a "slice" of an object within the relevant field of view, but for the entire frontal surface of the object. The guess work and imprecision that characterizes Yasui is absent from the present invention.

Because Yasui fails to disclose every element recited in amended claim 1 and claims dependent therefrom, Yasui is overcome as a 35 USC §102(a) reference. Applicants respectfully submit therefore that claims 1, 2, 5, 6, 8-11, and 14 are not anticipated by Yasui.

REJECTIONS OF CLAIMS 3, 4, and 12:

At ¶6 of the pending Office Action, claims 3, 4, and 12 were rejected under 35 USC §103 as unpatentable over Yasui '598 in view of Breed et al. US Pub. 2001/0003168.

As noted in the discussion of Yasui re amended claim 1, Yasui at best can determine coordinates for a single slice of an object or occupant. But unless the entire object (or occupant) can be imaged, one cannot identify the various components comprising the object, e.g., chest, left arm, right arm, etc.

Breed does not disclose a single time-of-flight sensor system to determine relative relation of a component of an occupant to an airbag. Indeed at para. [0167] Breed describes a new class of laser for use in range finding up to 30 M. Apparently using conventional two-dimensional imaging to locate a particular feature of an object, Breed then uses an aiming mechanism to enable his powerful laser to determine the range to the feature in question. Clearly Breed's approach is impractical to safely determine the relation of occupant components to an airbag. Breed is also silent as to how acquiring linear distance from the laser to the occupant feature would somehow be useful in determining the distance from the feature to the airbag.

In short, a combination of Yasui's single-slice data acquisition system with Breed's 30 M range laser system would not yield the three-dimensional information used by the present invention to determine where occupant components are in three-dimensional space relative to an airbag. Applicants respectfully submit therefor that claims 3, 4 and 12 are patentable over any combination (assuming a combination were feasible) of Yasui and/or Breed.

REJECTION OF CLAIM 13:

At ¶7 of the pending Office Action, claim 13 was rejected under as unpatentable over Yasui '598 in view of USP 5,785,347 to Adolph et al. As noted earlier herein, Yasui does not and cannot acquire a three-dimensional profile of the occupant space in a vehicle. Adolph '347 as stated at col. 1, lines 3-65, spanning col. 2, line 1 uses a system that requires "several input devices ... used together or in some combination". These devices include a seat mechanism to determine presence of an object or childseat, an IR sensor, a reflective capacitor sensor, a radar sensor, etc.

But even if what is disclosed in Yasui could be combined with what is disclosed in Adolph, the result would still not be applicants's three-dimensional system to determine occupant extremity position. Clearly if Yasui could acquire three-dimensional data, he would not need Adolph, and if Adolph's IR sensor could acquire three-dimensional data,

he would not need all of his other sensors. Applicants submit that claim 13 is patentable over any combination of Yasui and/or Adolph.

REJECTION OF CLAIM 7:

At ¶8 of the pending Office Action, claim 7 was rejected under as unpatentable over Yasui '598 in view of USP 6,116,638 to Hosoda. Hosoda is cited as classifying passenger data upon vehicle ignition, and is combined with Yasui and Adolph to render claim 7 unpatentable. But as noted, the presently claimed invention is directed to a method whereby three-dimensional depth images are captured and examined to classified at ignition start-up. But neither Yasui, Adolph, nor Hosoda describe a system or method whereby three-dimensional images are acquired. It is true that Hosoda discloses examining information at ignition start-up, but information acquired from any combination of Yasui and/or Adolph is not acquired from captured three-dimensional images. Thus applicants respectfully submit that claim 7 is patentable over any combination of Yasui, Adolph, and/or Hosoda.

REJECTION OF CLAIMS 15-25, AND 28-30:

At ¶9 of the pending Office Action, claims 15-25, and 28-30 were rejected under 35 USC §103(a) as unpatentable over Yasui '598 in view of USP 6,302,438 to Stopper et al. Stopper is said to disclose determining "occupant depth information based on a time of flight characteristic of reflected light". But unlike the invention defined by amended claim 15, Stopper does not disclose use of an optical array time-of-flight system to acquire a three-dimensional depth image of an occupant or occupant space. Instead Stopper refers to preexisting range and proximity sensors to monitor the volume of space in an airbag deployment region; see Stopper col. 8, line 34. As noted in col. 8, lines 16-18, Stopper must make assumptions using acquired information as to location of the seat back (col 8, 16-18) when the seat is not occupied. As noted at col. 8, line 67, Stopper's sensors typically use radio frequency electromagnetic energy. But such

sensors as Stopper uses lack the ability to focus light over an array of pixels so as to create a clear true three-dimensional surface map.

If Stopper could acquire true three-dimensional imagery, there would be no need for his reliance upon use of the volume formed in front of a seat back as an indication of the presence of a head in the normal seating position. If the seat back is then moved back from its previously measured position, Stopper's imprecise system would likely not be able to detect that a head volume was now present in space vacated by the former seat back position. Yasui's acquisition of single-slice data is similarly imprecise, and like Stopper does not involve acquisition of true three-dimensional information. Indeed, if Yasui acquired true three-dimensional information there would be no need for Stopper, and vice versa.

In contrast to Stopper's imprecise system and in contrast to Yasui's single slice acquisition system, the present invention as defined by amended claim 15 uses a three-dimensional sensor system whose pixel array acquires three-dimensional data. The resultant three-dimensional surface map obtained from the present invention allows the present invention to readily determine an object or occupant position in three-dimensions, and to readily identify or locate an occupant component.

Applicants thus submit that amended claim 15 is patentable over any combination of Yasui and/or Stopper. Thus, claims 15-31 are allowable, and should be passed to allowance at this time.

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Reconsideration of this application is respectfully requested. As demonstrated here, the presently claimed invention is patentable over art of record. Applicants request that the Examiner reconsider his outstanding rejections, which should be withdrawn. Pending claims 1-31 should be passed to allowance at this time.

CONCLUSION

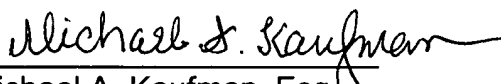
All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided below.

Prompt and favorable consideration of this Amendment and Response is respectfully requested.

Respectfully submitted,

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